DEMOGRAPHIC DIVIDEND IN INDONESIA

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ABSTRACT

The impact of population on the economy, called the demographic dividend, is an increase in the share of population in the economic growth. The demographic dividend is the accelerated economic growth that may result from a decline in a country's mortality and fertility and the subsequent change in the age structure of the population (Gribble and Bremner 2012). World Bank (2016) classified Indonesia as early-demographic dividend countries. Samosir (2015) proposed that in Indonesia, the window of opportunity to reap the first demographic dividend in Indonesia occurred since the 1970s when fertility started declining. A measure of demographic dividend is the dependency ratio. The demographic dividend is the increase of the share of population in the economy.

The analysis employed a non-linear method. The predictor is the gross domestic product (GDP) Current Price. The covariates are investment and population (employment opportunity). The data come from the Indonesia's National Account in 1970-2015. Using the Cobb-Douglas (CD) model it was found that the share of population on the economy in Indonesia as a whole is 21.2442% and the share of employment opportunity is 23.0863%. Demographic dividend is the difference in these shares in the econometric model.

Using a generalized Cobb-Douglass (GDC) model, after dividing the data into two time spans, it was found the acceleration of population share on the economy (demographic dividend through the whole population) amounted to 1.1527% and the acceleration of employment opportunity amounted to 1.8874% (demographic dividend through employment opportunity).

Key words: Demographic dividend, the share of population, early demographic dividend, generalized Cobb-Douglas model, employment opportunity, Indonesia.

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Introduction

World Bank (2016) classified all countries in the world in four groups in terms of development achievement in human capital. These groups are pre-demographic dividend, late demographic dividend, early-demographic dividend countries, and post-demographic dividend. Pre-demographic dividend countries are typically low-income countries, lagging in key human development indicators and with current fertility levels above four children per woman which results in rapid population growth. Late demographic dividend countries are typically upper-middle-income countries where fertility rates are typically above replacement levels of 2.1 children per woman, but fertility continues to decline. Early demographic dividend countries are typically lower-middle-income countries with the fertility transition. Fertility rates have fallen below four children per woman and the productive age share of the population is likely rising notably. Post-demographic dividend countries are typically high-income countries where fertility has transitioned below replacement levels. Indonesia is grouped into early demographic dividend.

Referring to the demographic dividend term, this framework helps explain the experiences from some countries in Asia, which is then successful in Latin America, and results in the optimism in improving developing countries' economy, in particular Sub Saharan Africa. An objective of development policies is to create an environment for sustainable and rapid economic growth. The economic success of 'Asian Tigers' during the 1960s and 1970s has motivated an idea of how different sectors can work together to make this growth a reality. Referring to the demographic dividend term, this framework helps explain the experiences from some countries in Asia, which is then successful in Latin America, and results in the optimism in improving developing countries' economy, in particular Sub Saharan Africa.

In 1996, Indonesia ranked at the 16th in nominal gross domestic product/GDP (US$940,953 billion), with a share of 1.25% of world's economy, and GDP purchasing power parity/PPP of US$3,027.83 billion, with a share of 2.54% of world's economy, and is projected to be at the 8th in 2020 (World Bank Data 2016). The question is how will Indonesia achieve that growth? With a population of about 258,7 million in 2016 and will be around 271,1 million in 2020, it is not too much if Indonesia can capitalize its population as development asset, and not just as a

burden. The main engine of world's development acceleration is the stock of people's knowledge. The ultimate resources is the people. The main engine of growth is the skilled, spirited, and hopeful people, who exercise their wills and imaginations for their welfare and the welfare of all people (Simon 1996).

The demographic dividend is the accelerated economic growth that can be resulted from the decline in fertility and mortality and the subsequent change in the population age structure. The change in population structure happens because of the demographic transition from high fertility and mortality to low high fertility and mortality which results in the declining of young dependent population relative to the working age population. This opens a window of opportunity for a country for a rapid economic growth if supporting social and economic policies are developed and the right investment is made. With the implementation of key policies in the long term, countries such as Thailand and Brazil have reaped the results of the demographic dividend (Gribble and Bremner 2012).

Notestein (1945) defined that the demographic transition as a process where a country experiences fertility and mortality decline. Fertility and mortality are the main components of population growth. Mortality decline has caused stable and sustainable fertility decline. Fertility and mortality decline are important factors in a population's age structure that can have implication in economic growth. Lowering fertility and changing the population age structure is a first step toward a demographic dividend. Post-demographic dividend countries are mostly high-income countries where fertility has transitioned below replacement levels (World Bank, 2016).

However, it should be noted that economic growth is not automatic and is also a joint impact of economic policies in a country. Factors such as trade policy, industrial policy, education, government administration, culture, geography, saving, and capital accumulation are other important factors for the demographic dividend. There are four policy steps to reach the demographic dividend: initiating demographic change, improving people's health, investing in education, and implementing economic and governance policies. The first step toward a demographic dividend is a rapid fertility decline through investments in family planning, child survival and educating girls. Healthy children do better in school, and this success ultimately contributes to a higher-skilled labor force. Youth also

have health needs to be addressed, and maintaining the health of adults is critical to economic productivity. Education systems must focus on ensuring that more young people complete school and giving youth the skills to adapt to the changing labor market. Economic and governance policies must foster job growth and investment in labor-intensive sectors, support the expansion of infrastructure, promote trade to ensure access to international markets, and create a secure environment and incentives for foreign direct investment (NCPD, 2014)

In other word, it is important to note that some policy makers inappropriately think that the demographic dividend is automatically obtained without population, social, and economic policies. A country that already reaped the demographic dividend already invested in its human capital (health and education) and implemented political and economic policies that were directed to the demographic dividend, with a sustainable political commitment, to capitalize the window of opportunity.

In the 1965-1990 period, the "Asian Tigers", that is Japan, Hong Kong, South Korea, Taiwan, Singapore, Taiwan, Indonesia, Thailand, and Malaysia experienced higher economic growth in the world's history (Ray 1998). An understanding about this growth is the source of this growth. The experiences of these nine countries achieved from the accumulation of capital and human capital. The above countries were not net-exporter of capital. Human capital level, on all indicators, was very high relative to per capita income levels. Before 1965, Hong Kong, South Korea, and Singapore had achieved universal primary education. In 1987, the secondary enrollment rate had achieved 88%, increased from 35% in 1965. Indonesia achieved 46%. It is long known that Hong Kong, South Korea, Singapore, and Taiwan are successful in rapid economic transition from agriculture-based to technology-based. Experience of each country is different, but in general their experiences are based on human capital development (Gribble dan Bremner 2012).

Jones (2001) modified Romer's model (1994), argued that economic growth rate is proportional to population size. One thing continuously happens in Romer's model is while the population increases, the per capita economic growth rate also increases (Rajagukguk, 2010). The increase in the share of population on the economy is called the demographic dividend. Samosir (2015) proposed that in Indonesia, the window of opportunity to reap the first demographic dividend in Indonesia occurred since the 1970s when fertility started declining. A measure of

demographic dividend is the dependency ratio. The demographic dividend is the increase of the share of population in the economy.

Douglas examined the elasticity of labor supply and capital and how their variations influenced the income distribution (Douglas 1934). Felipe and Adams (2005) used Cobb-Douglas' data set (1928) for the world and found that the elasticity of labor supply, employing the ordinary least square (OLS) method, was 0.751 and the elasticity of capital was 0.246.

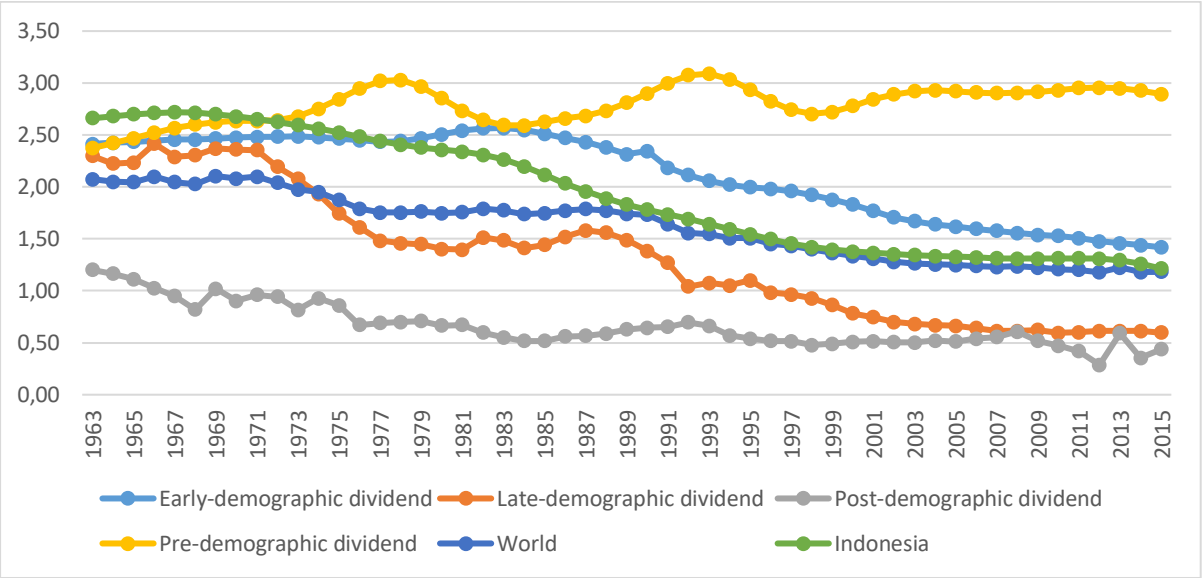
The study in this paper aims to examine the share (output elasticity of population) of population to the economic growth and the magnitude of the demographic dividend as a result of the success in development in population policy in Indonesia. In this study the demographic dividend is defined as the increase in the share of labor supply to the economy. Referring to the study by Felipe and Adams (2005), they found that the share of population to the world's economy, employing Cobb-Douglas model, which increased significantly from 0.525 in 1899-1903 to 0.665 in 1899-1904, 0.688 in 1899-1910, and 0.726 in 1899-1922. In addition, factors such as trade policies, industrial policies, education, governance, culture and geography are portrayed as technological progress.

In Figure 1 the population growth rate of early demographic dividend, late demographic dividend, post- demographic dividend, pre-demographic dividend, the world, and Indonesia in 1963-2015. It can be seen that the population growth rate of post-demographic dividend countries generally is lower than the population growth rate of early demographic dividend, late demographic dividend, pre-demographic dividend, the world, and Indonesia. It can also be seen that Indonesia's population growth rate dynamic tends to be similar with population growth rate dynamic of early demographic dividend and above the population growth rate of late demographic dividend, post-demographic dividend, and the world. It can be said that Indonesia has experienced the demographic dividend. The success of development in human capital can be indicated by the rapid decline in population growth rate, in particular when Indonesia launched the national family planning program in 1970.

In Figure 2 the graph of relationship between the employment to population ratio age 15+ with the gross domestic product (GDP) in Indonesia in 1991-2014 is

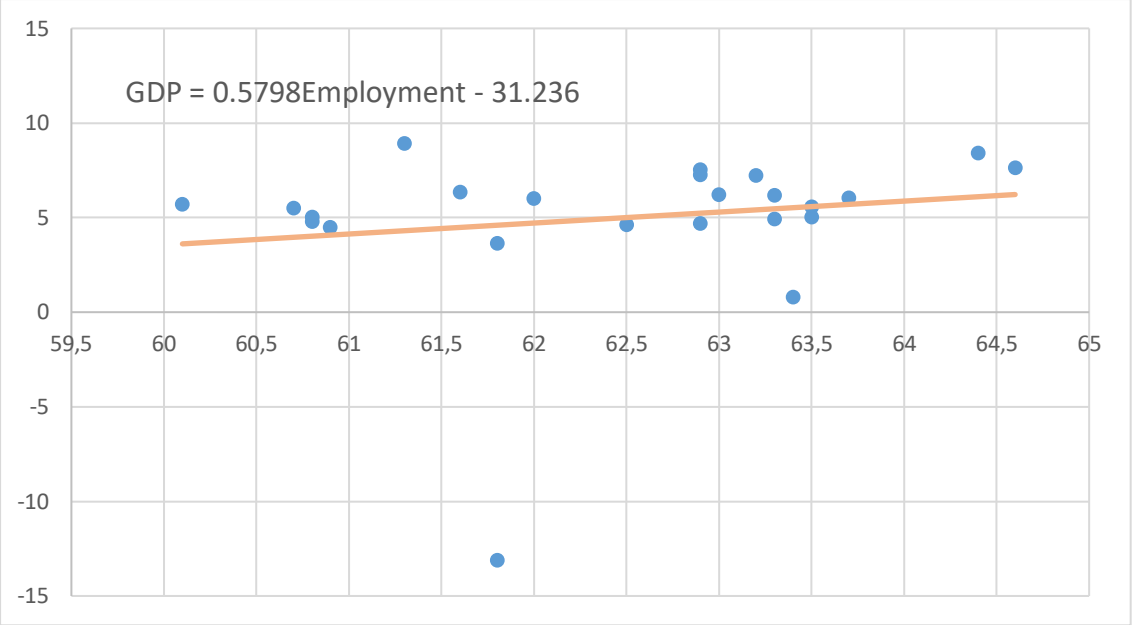
presented. It can be seen that the employment to population ratio age 15+ has positive relationship with GDP. It is also an indication that the demographic dividend has happened in Indonesia.

In Figure 3 the graph of relationship between the investment with the gross domestic product (GDP) in Indonesia in 1970-2015 is presented. It can be seen that the investmen has stronger positive relationship with GDP. An increase of 1 million US $ in investment will cause an increase in GPD 2.95 million in Indonesia during 1970-2015.



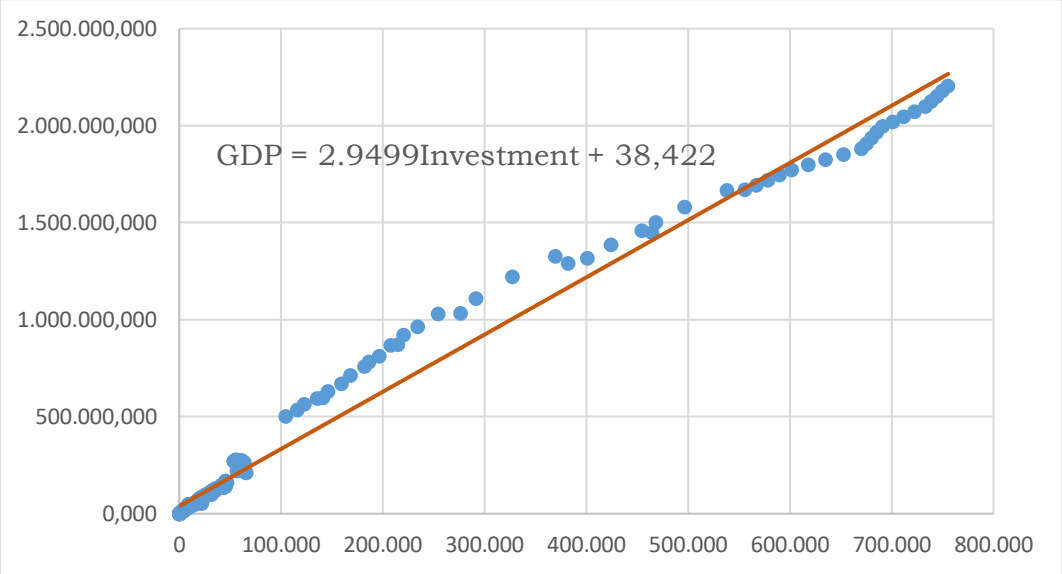
Source: World Bank (2016).

Figure 1
Population Growth Rate: Early Demographic Dividend, Late Demographic Dividend, Post Demographic Dividend, Pre Demographid dividend, World, and Indonesia: 1963-2015



Source: World Bank (2016) (author's).

Figure 2
Employment to Population Ratio 15+ (yearly) and Gross Domestic Product Growth (yearly): Indonesia 1991-2014



Source: World Bank (2016) (author's).

Figure 3
Investment and Gross Domestic Product (quarterly): Indonesia 1970-2015

Research Methods

Data

Data in this study come from Indonesia Macro-aggregate Quarterly Account. The study covered the period from the first quarter in 1970 to the fourth quarter in 2015. Therefore, there are 184 time series observation in the study. The dependent variable is the gross domestic product (GDP) current price. The independent variables are investment (private and government expenditure) and population. An analysis using employment opportunity as the proxy of population was also carried out.

To examine and study the impact of population dynamic (demographic dividend) on economic growth in Indonesia, the analysis is done for two time periods. The first period is the first 92 quarters, while the second period is the last 92 quarters.

Methods

The method employed in this study is the Cobb-Douglas (CD) function. The CD production function is special functional form from production function that is generally used to express technological relationship between two or more inputs. In general the used inputs are capital and manpower (population) and output that can be produced using that input. Sometimes constraints are imposed, such as the production function is constant returns to scale. Cobb-Douglas function was developed and tested statistically using empirical data by Charles Cobb and Paul Douglas in 1927–1947.

Model in this study employing nonlinear regression method, that generalized Cobb-Douglass (GDC) model, using time *t* as input variable.

Model equation

This study fits CD model in two parts. In the first part, CD model for Indonesia as a whole was examined from 1970 to 2015. Two GDPs are used, that is current price GDP

a. Model Cobb-Douglas

Model in this part can be written as the following equation.

$$Y = A.K^{\alpha}.L^{\beta}$$

where Y =GDP, K = capital, and L = manpower/population, α =capital share, and β = population/manpower share.

b. Cobb-Douglas Model with dummy variable (to examine the demographic dividend)

To examine the demographic dividend, model fitting for the following CD function model was carried out.[2]

$$Y = A_1 X_1^{c(12)}.X_2^{c(13)}).DV1 + A_2 * X_1^{c(22)}.X_2^{c(23)}).DV2$$

where Y = GDP, X_1 = investment, X_2 = population, A_1 = technological progress in the first period, $c(12)$ = share of investment in the first period, $c(13)$ = share of population in the first period, A_2 = technological progress in the second period, $c(22)$ = share of investment in the second period, $c(22)$ = share of population in the first period, $DV1$ and $DV2$ are two dummy variables for time periods, that is $t \leq 92$ and $t > 92$.

In this study, the demographic dividend is defined as the increase in the share of population in the economy. If this share increases by time (%), then it will be the magnitude of the demographic dividend is being reaped in Indonesia.

[2] Agung (no date) named this function as generalized Cobb-Douglass (GDC) model.

Results

In Table 1 summary statistics of variables in the model is presented. These include the number of observations, mean, median, maximum, minimum and standard deviation (Std.Dev.)

Table 1. Summary Statistics of Variables in the Model

Variable	Observations	Mean	Median	Maximum	Minimum	Std.Dev.
GDP (Current Million US$)	184	425,144.3	75,549.5	2,205,996.0	808.9	659,186.9
Investment (Current Million US$	184	131,096.2	20,530.0	755,392.6	110.2	221,905.7
Population (000)	184	184,652.7	186,429.6	257,563.8	115,929.7	40,231.5
Employment (000)	184	76,801.0	78,603.7	166,258.6	20,019.4	31,510.0

Source: Indonesia National Account in 2007-2015 (own calculation).

1. Cobb–Douglas (CD) Model

Cobb-Douglas model in this part was done using constant return-to scale (CRS) restriction, where the share of investment plus the share of population are restricted to be equal with one.

a. Using the current price GDP and Population.

It can be seen from Table 1 that technological progress in Indonesia is 3.626768, the share of investment is 0.787558 (79%), and the share of population size is 0.212442 (21%) to the economy of Indonesia using current price GDP.

Table 1

Variable, Parameter Estimate, Standard Error, *t*-Statistic, and Probability for Cobb-Douglas Model: Indonesia 1970-2015

Variable	Parameter Estimate	Standard Error	*t*-Statistic	Probability
A	3.626768	0.029674	122.2185	0.0000
C(1)	0.787558	0.008826	89.23388	0.0000
C(2)	0.212442	89.23388	89.23388	0.0000

Source: Indonesia National Account in 2007-2015 (own calculation).

Dependent Variable: Current Price GDP.

b. Using the current price GDP and employment opportunity.

It can be seen from Table 3 that technological progress in Indonesia is 4.273472, the share of investment is 0.769137 (77%), and the share of employment opportunity is 0.230863 (23%) to the economy of Indonesia using the current price GDP in 1970-2015.

Table 3

Variable, Parameter Estimate, Standard Error, *t*-Statistic, and Probability for Cobb-Douglas Model: Indonesia 1970-2015

Variable	Parameter Estimate	Standard Error	*t*-Statistic	Probability
A	4.273472	0.081185	52.63860	0.0000
C(1)	0.769137	0.012617	60.96112	0.0000
C(2)	0.230863	0.012617	60.96112	0.0000

Source: Indonesia National Account in 2007-2010 (own calculation).

Dependent Variable: current price GDP.

2. Generalized Cobb-Douglass (GDC) Model

This model was employed to examine the effect of the demographic dividend. In this model, the time is divided into two periods: first 92 quarters and last 92 quarters. The results of model fitting are as follows (Table 4).

It can be seen from Table 4 that Further, technological progress in Indonesia from 1970 to 1992 is 2.1387683, the share of investment is 0.793583 (79%), and the share of population is 0.206417 (21%) to the economy of Indonesia using current price GDP. Further, technological progress in Indonesia from 1993 to 2015 is 3.667257. It means that there was an improvement in technological progress in Indonesia in the two periods, from 2.1387683 in the first period to 3.667257 the second period. The share of investment is 0.774709 (77.5 %), and the share of population is 0.225291 (22.5 %) to the economy of Indonesia using the current price GDP.

The demographic dividend is the difference between the share of population in the second period and the share of population in the first period of the study. It is 0.225291 – 0.206417 = 0.018874 or 1.8874%.

Table 4

Variable, Parameter Estimate, Standard Error, *t*-Statistic, and Probability for Generalized Cobb-Douglas Model: Indonesia 1970-2010

Variable	Parameter Estimate	Standard Error	*t*-Statistic	Probability
A1	2.138768	1.691559	1.264377	0.2077
C(11)	0.793583	0.293658	2.702406	0.0075
C(12)	0.206417	0.293658	2.702406	0.0075
A2	3.667257	0.029127	125.9074	0.0000
C(21)	0.774709	0.008637	89.69956	0.0000
C(22)	0.225291	0.008637	89.69956	0.0000

Source: Indonesia National Account in 2007-2015 (own calculation).

Dependent Variable: current price GDP.

In Table 5 the results of model fitting using the currrent price GDP with investment and employment opportunity as the independent variables. In the first period the share of employment opportunity is 0.233669 and in the second period it is 0.248226. The demographic dividend reaped by Indonesia from the employment opportunity is 0.248226 - 0.233669 = 0.01527 (1.527%). It means that the employment opportunity dynamic in Indonesia in the second half period had an impact on economic growth acceleration in Indonesia for 1.527%.

Table 5

Variable, Parameter Estimate, Standard Error, *t*-Statistic, and Probability for Generalized Cobb-Douglas Model: Indonesia 1970-2015

Variable	Parameter Estimate	Standard Error	*t*-Statistic	Probability
A1	2.450927	1.775801	1.380181	0.1692
C(11)	0.766301	0.398819	1.921427	0.0563
C(12)	0.233669	0.398819	1.921427	0.0563
A2	4.386645	0.083428	52.57982	0.0000
C(21)	0.751774	0.012657	59.39543	0.0000
C(22)	0.248226	0.012657	59.39543	0.0000

Source: Indonesia National Account in 2007-2015 (own calculation).

Dependent Variable: current price GDP.

Conclusions

Development in population policy has been implemented greatly in Indonesia, in particular the family planning program by the National Population and Family

Planning Board. Fertility and the dependency ratio declined. The ultimate goal is the welfare of the people. The welfare is measured by the economic growth, in this case the gross domestic product. The econometric model used in this study is the Cobb-Douglas growth model. This model can be used to investigate the impact of population on the economy. This impact is called the share of population in Cobb-Douglas model. Further, the demographic dividend is defined as the growth of the share of population to GDP. The model assumption is constant returns to scale (CRS). This is done with a purpose that the modeling is simple. Modeling without CRS restriction results in unexpected outcomes that are statistically insignificant variables.

The share of population to GDP in Indonesia during the period of 1970-2015 is 21%. In the same period, if population is replaced with employment opportunity, the share increased to 23%. It means the working population has greater impact on the economy of Indonesia compared to the population as a whole. Further, the demographic dividend using the population as a whole is 1.8874%.

However, the economic growth acceleration because of the labor force dynamic in the study periods is 23.3669%. In the second period of study, the Indonesia's labor force is more productive 24.8226% compared to in the first period of study.

On the other side, the technological progress in Indonesia in the first period is 2.450927 and in the second period is 4.386645. It means there is an increase and improvement in technological progress in Indonesia during the study period. Indonesia reaped technological progress that impacted and accelerated economic growth. The demographic dividend using the population as a whole is 1.8874%.

Policy Recommendations

Indonesia is experiencing the demographic dividend. The demographic dividend is the economic impact reaped as an impact of development in population policy. Population policy meant in particular is the family planning program, health development, and investment in human capital through education and working environment improvement and investment. Development in population is successful in producing the demographic dividend. Indonesia needs to continue the improvement of development of the people through strategies such as follows.

1. Population growth management.
2. Development in population health.
3. Development in human capital, in particular education and training.

On the other side, Indonesia has to improve the development in technological progress continuously. Although, it is not portrayed in the model directly, policies in trade, industry, education, governance, culture, geographical location, and international trade must continue to be done. The demographic dividend can be reaped only the development in population is accompanied with technological progress policies.

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